WHAT IS CLAIMED IS:

1   1.   A method for handling packets, comprising:

2   performing preliminary multi-protocol frame classification for incoming frames;

3   processing at least the incoming frame and the preliminary multi-protocol

4   frame classification to provide parsing instructions; and

5   providing multi-stage parsing of the incoming frame according to the parsing

6   instructions to generate search results presenting information about the incoming

7   frame.

1   2.   The method of claim 1 wherein the performing preliminary multi-

2   protocol frame classification further comprises resolving a composition for the

3   incoming frame.

1   3.   The method of claim 1 wherein the processing further comprises:

2   storing an incoming frame in a memory buffer;

3   generating the parsing instructions for the incoming frame based upon the

4   multi-protocol frame classification; and

5   aligning the generated parsing instructions with frame data selected from the

6   incoming frames stored in the memory buffer.

1   4.   The method of claim 1 wherein the providing multi-stage parsing of the

2 incoming frame further comprises:

3   reading at least a portion of the incoming frame from a memory buffer;

4   interpreting the parsing instructions; and

5   executing macros for performing parsing functions on at least the portion of

6 the incoming frame using the interpreted parsing instructions.

1   5.   The method of claim 1 wherein the providing multi-stage parsing of the

2 incoming frame further comprises:

3   generating extractions instructions in response to the at least incoming frame

4 and the preliminary multi-protocol frame classification;

5   using the extraction instructions to produce search queries; and

6   applying the search queries against a memory to produce the search results.

1   6.   The method of claim 5 wherein the using the extraction instructions

2 further comprises conditional extraction.

1   7.   The method of claim 6 wherein conditional extraction comprises

2 determining whether extracted bits of data from the packet meet a predetermined

3 criteria.

1   8.   The method of claim 5 wherein the providing multi-stage parsing of the

2   incoming frame further comprises:

3   reprocessing the search results to generate refined parsing instructions; and

4   parsing of the incoming frame according to the refined parsing instructions to

5   generate refined search results, the refined search results providing greater

6   information about the incoming frame.

1   9.   The method of claim 1 wherein the providing multi-stage parsing of the

2   incoming frame further comprises:

3   reprocessing the search results to generate refined parsing instructions; and

4   parsing of the incoming frame according to the refined parsing instructions to

5   generate refined search results, the refined search results providing greater

6   information about the incoming frame.

1   10.   The method of claim 1 wherein the processing at least the incoming

2   frame and the preliminary multi-protocol frame classification further comprises

3   processing the search results, the incoming frame and the preliminary multi-protocol

4   frame classification to provide refined parsing instructions.

1   11.   The method of claim 1 wherein the parsing instructions comprise a

2   location identifier and an associated instruction to be applied to the frame at the

3   position identified by the location identifier.

1   12.   The method of claim 1 wherein the frame comprises one of a plurality

2   of frame protocols, the performing preliminary multi-protocol frame classification

3   further comprising classifying a protocol identity.

1   13.   The method of claim 1 wherein the performing preliminary multi-

2   protocol frame classification further comprises identifying each layer protocol and

3   writing the frame into memory along with a protocol layer code.

1   14.   The method of claim 13 wherein providing multi-stage parsing of the

2   incoming frame further comprises using the protocol layer code as a start vector into

3   an instruction memory, the instruction memory containing instructions for parsing the

4   frame and pointers to access selected words of the frame in a frame buffer.

1   15.   The method of claim 14 wherein the performing preliminary multi-

2   protocol frame classification further comprises identifying each layer protocol and

3   writing the frame into memory along with a protocol layer code, the method further

4   comprising processing the instructions from the instruction memory, resolving the

5   pointers according to the protocol layer table and aligning the frame data with the

6   instruction words.

1   16.   The method of claim 14 wherein the search results are fed back to an

2   instruction controller to be used as data that a parsing engine can parse through a

3   data pipe.

1 17. The method of claim 1 wherein the memory comprises a content

2 addressable memory and the search queries are used to search the content

3 addressable memory.

1 18. The method of claim 1 wherein the memory comprises a static random

2 access memory and the search queries are indexed directly to a static random

3 access memory.

1 19. The method of claim 1 further comprising providing a parser instruction

2 set in the instruction memory to define microcode used for generating the parser

3 instructions.

1 20. The method of claim 1 further comprising forwarding the frame and the

2 search results.

1 21. The method of claim 1 wherein the search results include the frame

2 classification.

1 22. The method of claim 16 wherein the search results are fed back to an

2 instruction controller to be used as a start vector for subsequent processing stages.

1 23. The method of claim 1 wherein providing multi-stage parsing of the

2 incoming frame further comprises performing conditional branching, the conditional

3 branching allowing specific instructions to be performed based upon satisfaction of a

4 predetermined criteria.

1   24.   A multi-protocol, multi-stage, real-time frame classifier, comprising:

2   a preliminary multi-protocol frame composition analyzer for performing

3   preliminary multi-protocol frame classification for incoming frames;

4   a parsing instruction generator for processing at least the incoming frame and

5   the preliminary multi-protocol frame classification to provide parsing instructions; and

6   a multi-stage parsing engine for providing multi-stage parsing of the incoming

7   frame according to the parsing instructions to generate search results presenting

8   information about the incoming frame.

1   25.   The multi-protocol, multi-stage, real-time frame classifier of claim 24

2   wherein the preliminary multi-protocol frame classifier resolves a composition for the

3   incoming frame.

1   26.   The multi-protocol, multi-stage, real-time frame classifier of claim 24

2   wherein the parsing instructions generator processing further comprises:

3   a memory buffer for storing an incoming frame;

4   an instruction generator for creating the parsing instructions for the incoming

5   frame based upon the multi-protocol frame classification; and

6   a data pipe for aligning the generated parsing instructions with frame data

7   selected from the incoming frames stored in the frame buffer.

1 27. The multi-protocol, multi-stage, real-time frame classifier of claim 24

2 wherein the multi-stage parsing engine reads at least a portion of the incoming

3 frame from a memory buffer, interprets the parsing instructions, and executes

4 macros for performing parsing functions on at least the portion of the incoming frame

5 using the interpreted parsing instructions.

1 28. The multi-protocol, multi-stage, real-time frame classifier of claim 24

2 wherein the multi-stage parsing engine generates extraction instructions in response

3 to the at least incoming frame and the preliminary multi-protocol frame classification.

1 29. The multi-protocol, multi-stage, real-time frame classifier of claim 28

2 wherein the multi-stage parsing engine performs conditional extractions using the

3 extraction instructions.

1 30. The multi-protocol, multi-stage, real-time frame classifier of claim 29

2 wherein conditional extraction comprises determining whether extracted bits of data

3 from the packet meet a predetermined criteria.

1 31. The multi-protocol, multi-stage, real-time frame classifier of claim 28

2 wherein the multi-stage parsing engine further comprises an extractor for using the

3 extraction instructions to produce search queries and a memory for applying the

4 search queries against to produce the search results.

1   32.   The multi-protocol, multi-stage, real-time frame classifier of claim 31

2   further comprising a feedback path for allowing the search results to be reprocessed

3   to generate refined parsing instructions that are used by the parsing engine to

4   generate refined search results, the refined search results providing greater

5   information about the incoming frame.

1   33.   The multi-protocol, multi-stage, real-time frame classifier of claim 24

2   wherein the parsing instructions generator processes the search results, the

3   incoming frame and the preliminary multi-protocol frame classification to provide

4   refined parsing instructions.

1   34.   The multi-protocol, multi-stage, real-time frame classifier of claim 24

2   wherein the parsing instructions comprise a location identifier and an associated

3   instruction to be applied to the frame at the position identified by the location

4   identifier.

1   35.   The multi-protocol, multi-stage, real-time frame classifier of claim 24

2   wherein the frame comprises one of a plurality of frame protocols, the preliminary

3   multi-protocol frame classifier classifying the incoming frame to identify a protocol

4   identity.

1   36.   The multi-protocol, multi-stage, real-time frame classifier of claim 24

2   wherein the preliminary multi-protocol frame classifier identifies each layer protocol

3   and writes the frame into memory along with a protocol layer code.

1   37.   The multi-protocol, multi-stage, real-time frame classifier of claim 36

2   wherein the multi-stage parsing engine uses the protocol layer code as a start vector

3   for an instruction memory, the instruction memory containing instructions for parsing

4   the frame and pointers to access selected words of the frame in a memory buffer.

1   38.   The multi-protocol, multi-stage, real-time frame classifier of claim 37

2   wherein the parsing instructions generator identifies each layer protocol and writes

3   the frame into memory along with a protocol layer code and wherein the multi-stage

4   parsing engine processes the instructions from the instruction memory, resolves the

5   pointers according to the protocol layer table and aligns the frame data with the

6   instruction words.

1   39.   The multi-protocol, multi-stage, real-time frame classifier of claim 37

2   wherein the search results are fed back to the parsing instructions generator to be

3   used as data that a parsing engine can parse through a data pipe.

1   40.   The multi-protocol, multi-stage, real-time frame classifier of claim 24

2   wherein the memory comprises a content addressable memory and the search

3   queries are used to search the content addressable memory.

1   41.   The multi-protocol, multi-stage, real-time frame classifier of claim 24

2   wherein the memory comprises a static random access memory and the search

3   queries are indexed directly to a static random access memory.

1   42.   The multi-protocol, multi-stage, real-time frame classifier of claim 24

2   wherein the parsing instructions generator provides a parser instruction set in an

3   instruction memory to define microcode used for generating the parser instructions.

1   43.   The multi-protocol, multi-stage, real-time frame classifier of claim 24

2   wherein the multi-stage parsing engine forwards the frame and the search results.

1   44.   The multi-protocol, multi-stage, real-time frame classifier of claim 24

2   wherein the search results include the frame classification.

1   45.   The multi-protocol, multi-stage, real-time frame classifier of claim 39

2   wherein the parsing instructions generator further comprises an instruction controller

3   and wherein the search results are fed back to the instruction controller to be used

4   as a start vector for subsequent processing stages.

1   46.   The multi-protocol, multi-stage, real-time frame classifier of claim 24

2   wherein the multi-stage parsing engine performs conditional branching, the

3   conditional branching allowing specific instructions to be performed based upon

4   satisfaction of a predetermined criteria.

1   47.   An article of manufacture comprising a program storage medium

2   readable by a computer, the medium tangibly embodying one or more programs of

3   instructions executable by the computer to perform a method for parsing frames in a

4   network flow, the method comprising:

5   performing preliminary multi-protocol frame classification for incoming frames;

6   processing at least the incoming frame and the preliminary multi-protocol

7   frame classification to provide parsing instructions; and

8   providing multi-stage parsing of the incoming frame according to the parsing

9   instructions to generate search results presenting information about the incoming

10 frame.

1   48.   The article of manufacture of claim 47 wherein the performing

2   preliminary multi-protocol frame classification further comprises resolving a

3   composition for the incoming frame.

1   49.   The article of manufacture of claim 47 wherein the processing further

2   comprises:

3   storing an incoming frame in a memory buffer;

4   generating the parsing instructions for the incoming frame based upon the

5   multi-protocol frame classification; and

6   aligning the generated parsing instructions with frame data selected from the

7   incoming frames stored in the memory buffer.

1   50.   The article of manufacture of claim 47 wherein the providing multi-

2   stage parsing of the incoming frame further comprises:

3   reading at least a portion of the incoming frame from a memory buffer;

4   interpreting the parsing instructions; and.

5   executing macros for performing parsing functions on at least the portion of

6   the incoming frame using the interpreted parsing instructions.

1   51.   The article of manufacture of claim 47 wherein the providing multi-

2   stage parsing of the incoming frame further comprises:

3   generating extractions instructions in response to the at least incoming frame

4   and the preliminary multi-protocol frame classification;

5   using the extraction instructions to produce search queries; and

6   applying the search queries against a memory to produce the search results.

1   52.   The article of manufacture of claim 51 wherein the using the extraction

2   instructions further comprises conditional extraction.

1   53.   The article of manufacture of claim 52 wherein conditional extraction

2   comprises determining whether extracted bits of data from the packet meet a

3   predetermined criteria.

1   54.   The article of manufacture of claim 51 wherein the providing multi-

2   stage parsing of the incoming frame further comprises:

3   reprocessing the search results to generate refined parsing instructions; and

4   parsing of the incoming frame according to the refined parsing instructions to

5   generate refined search results, the refined search results providing greater

6   information about the incoming frame.

1   55.   The article of manufacture of claim 47 wherein the providing multi-

2   stage parsing of the incoming frame further comprises:

3   reprocessing the search results to generate refined parsing instructions; and

4   parsing of the incoming frame according to the refined parsing instructions to

5   generate refined search results, the refined search results providing greater

6   information about the incoming frame.

1   56.   The article of manufacture of claim 47 wherein the processing at least

2   the incoming frame and the preliminary multi-protocol frame classification further

3   comprises processing the search results, the incoming frame and the preliminary

4   multi-protocol frame classification to provide refined parsing instructions.

1   57.   The article of manufacture of claim 47 wherein the parsing instructions

2   comprise a location identifier and an associated instruction to be applied to the

3   frame at the position identified by the location identifier.

1   58.   The article of manufacture of claim 47 wherein the frame comprises

2   one of a plurality of frame protocols, the performing preliminary multi-protocol frame

3   classification further comprising classifying a protocol identity.

1   59.   The article of manufacture of claim 47 wherein the performing

2   preliminary multi-protocol frame classification further comprises identifying each

3   layer protocol and writing the frame into memory along with a protocol layer code.

1   60.   The article of manufacture of claim 59 wherein providing multi-stage

2   parsing of the incoming frame further comprises using the protocol layer code as a

3   start vector into an instruction memory, the instruction memory containing

4   instructions for parsing the frame and pointers to access selected words of the frame

5   in a memory buffer.

1   61.   The article of manufacture of claim 60 wherein the performing

2   preliminary multi-protocol frame classification further comprises identifying each

3   layer protocol and writing the frame into memory along with a protocol layer code,

4   the method further comprising processing the instructions from the instruction

5   memory, resolving the pointers according to the protocol layer table and aligning the

6   frame data with the instruction words.

1   62.   The article of manufacture of claim 60 wherein the search results are

2   fed back to an instruction controller to be used as data that a parsing engine can

3   parse through a data pipe.

1   63.   The article of manufacture of claim 47 wherein the memory comprises

2   a content addressable memory and the search queries are used to search the

3   content addressable memory.

1   64.   The article of manufacture of claim 47 wherein the memory comprises

2   a static random access memory and the search queries are indexed directly to a

3   static random access memory.

1   65.   The article of manufacture of claim 47 further comprising providing a

2   parser instruction set in the instruction memory to define microcode used for

3   generating the parser instructions.

1   66.   The article of manufacture of claim 47 further comprising forwarding

2   the frame and the search results.

1   67.   The article of manufacture of claim 47 wherein the search results

2   include the frame classification.

1   68.   The article of manufacture of claim 62 wherein the search results are

2   fed back to an instruction controller to be used as a start vector for subsequent

3   processing stages.

1   69.   The article of manufacture of claim 47 wherein providing multi-stage

2   parsing of the incoming frame further comprises performing conditional branching,

3   the conditional branching allowing specific instructions to be performed based upon

4   satisfaction of a predetermined criteria.

1   70.   A method for handling packets, comprising:

2   performing preliminary multi-protocol frame classification for incoming frames;

3   processing at least the incoming frame and the preliminary multi-protocol

4   frame classification to provide parsing instructions; and

5   providing parsing of the incoming frame according to the parsing instructions

6   to generate search results presenting information about the incoming frame.

1   71.   A method for handling packets, comprising:

2   processing at least the incoming frame to provide parsing instructions; and

3   providing multi-stage parsing of the incoming frame according to the parsing

4   instructions to generate search results presenting information about the incoming

5   frame.

1   72.   An article of manufacture comprising a program storage medium

2   readable by a computer, the medium tangibly embodying one or more programs of

3   instructions executable by the computer to perform a method for parsing frames in a

4   network flow, the method comprising:

5   performing preliminary multi-protocol frame classification for incoming frames;

6   processing at least the incoming frame and the preliminary multi-protocol

7   frame classification to provide parsing instructions; and

8   providing parsing of the incoming frame according to the parsing instructions

9   to generate search results presenting information about the incoming frame.

1   73.   An article of manufacture comprising a program storage medium

2   readable by a computer, the medium tangibly embodying one or more programs of

3   instructions executable by the computer to perform a method for parsing frames in a

4   network flow, the method comprising:

5   processing at least the incoming frame to provide parsing instructions; and

6   providing multi-stage parsing of the incoming frame according to the parsing

7   instructions to generate search results presenting information about the incoming

8   frame.

1   74.   A multi-protocol, multi-stage, real-time frame classifier, comprising:

2   a preliminary multi-protocol frame composition analyzer for performing

3   preliminary multi-protocol frame classification for incoming frames;

4   a parsing instruction generator for processing at least the incoming frame and

5   the preliminary multi-protocol frame classification to provide parsing instructions; and

6   a parsing engine for providing multi-stage parsing of the incoming frame

7   according to the parsing instructions to generate search results presenting

8   information about the incoming frame.

1   75.   A multi-protocol, multi-stage, real-time frame classifier, comprising:

2   a parsing instruction generator for processing an incoming frame to provide

3   parsing instructions; and

4   a multi-stage parsing engine for providing multi-stage parsing of the incoming

5   frame according to the parsing instructions to generate search results presenting

6   information about the incoming frame.